CONTACT LENS HAVING AT LEAST ONE ASPHERICAL, PROGRESSIVE MULTIFOCAL FACE, PROCESS FOR THE PREPARATION THEREOF AND USE OF THIS CONTACT LENS AS AN INTRA-OCULAR IMPLANT TO BE SUBSTITUTED FOR THE EYE CRYSTALLINE LENS

BACKGROUND OF THE INVENTION

The invention essentially relates to a contact lens having at least one aspherical, progressive multifocal face, a process of preparation thereof and the use thereof as an intra-ocular implant to be substituted for the eye crystalline lens.

There is now an increased need for contact lenses allowing the vision both for far and near, for persons having difficulties for accommodation, notably the presbytic patients.

A number of solutions have been proposed these last years to solve this technical problem. Most of them are based on the location of a vision correction for near, at the periphery of the lens, different from the vision correction for far, by a simple movement of the lens at the time of lowering the eyes, in the path from the far vision (horizontal looking) to the near vision (see FR-A-No. 1 423 908 YSOPTIC).

In this movement, the lens, by bearing on the edge of the lower eye lid, is displaced upwards during the lowering of the looking and is putting in place the near correction before the pupil.

Two types of lenses have been proposed, the first type consisting in the performing of a near vision located at the periphery of the lens, in a restricted area of the lens, the rest of the lens performing a correction for far.

The second type of lens is generally conceived to perform a correction for near and the central portion is flattened to perform a correction for far. This lens is called a bifocal type lens. Thus, the vision for near is corrected at the periphery of the lens, the center performing a correction for far.

In the case where the lens is displaced by bearing on the edge of the lower eye lid, the lens does not provide a good correction. Indeed, in most cases, in view of the great number of parameters to be satisfied, the two corrections are subsisting and the subject has a double vision. The problem can only be solved in that case from 1 to 2% of the cases. These parameters are for instance the diameter of the restricted area, the position of the latter, the clearance of the lower eye lid, the diameter of the pupil, the importance of the displacement of the lens etc. . . .

A good working of the lens supposes the coexistence of two contradictory conditions, namely:

A sufficiently ample displacement of the lens, and

a good tolerance in the wearing of the lens which supposes a limitation of the displacements thereof.

On the other hand, with these bifocal or multifocal lenses, an additional problem lies in that at the border line of the portion correcting the vision for near with the portion for correcting the vision for far, a junction is obtained also called an intermediary line or a transition zone, due to the differences of curvature radius to obtain the bifocal or multifocal character of the lens. Such junctions are generating a junction or intermediary zone causing a jump in image. In the case of multifocal lenses, there is thus obtained a multiplication of the junctions, which is unacceptable.

To remedy to these drawbacks, other solutions have been proposed trying to introduce a progressive curvature or bend on the external or inner face of the lens to allow a progressive passage from the vision for far to the vision for near, either by the movement of the lens, or by performing a progressive power from the centre up to the edge of the lens, inside the pupil (simultaneous vision).

However, such solutions are again unsatisfactory as regards the quality of the correction, in particular with respect to the value of the near correction to be reached, as concerns the clearness of the corrected image.

SUMMARY OF THE INVENTION

One main object of the present invention is therefore to provide new contact lenses without the abovesaid drawbacks of the prior contact lenses, with an excellent correction for near as well as an improved clearness (distinctness) of the image.

Another main object of the present invention is also to provide a new multifocal contact lens of a particularly simple conception, as well as a process for easily manufacturing it so as to limit or lower the manufacturing cost of this new lens.

All these objects and purposes are achieved according to the present invention by the provision of a contact lens, having at least one aspherical, multifocal face, comprising at least an optical zone for the vision for near and at least one optical zone for the vision for far, without intermediary line and without transition between said zones, characterized in that said aspherical face is foreseen so as to define a central optical zone with a predetermined great aberration, with a predetermined size, this great aberration of said central optical zone being the greatest of the lens.

According to a particular embodiment, the abovesaid central optical zone of great aberration constitutes an optical zone for the vision for near.

According to a specific embodiment of the invention contact lens, at least one face has a general shape selected among a torus surface, the revolution axis of said torus being essentially identical with the optical axis of said lens.

According to a particular feature, the curve or line generating the torus surface is selected from the group consisting of a circular curve, a parabolic curve, a hyperbolic curve and an elliptic curve, or any combination thereof.

According to another specific feature of the invention lens, the distance from the centre of the torus generating line to the axis of revolution of the torus is very low, preferably about 3 to 4 hundredth of millimetres, thereby having the peripheral portion or peripheral optical zone of said lens face very close substantially to the osculating sphere thereof.

According to an actually preferred embodiment, the size of the central optical zone with great aberration is substantially equal to, or lower than, that of the eye pupil, preferably from 1.5 to 2.5 millimeters.

Advantageously, this central optical zone is close to the axis of revolution of said torus.

According to another particular embodiment of the invention lens, this lens has at least one face having generally a tapered torus shape with respect to a identical lens of the same revolution axis having the same face